ZooKeys 1212: 255–266 (2024)
DOI: 10.3897/zookeys.1212.127558

Research Article

Four new species of the genus *Hendelia* Czerny, 1903 (Diptera, Clusiidae) from China

Shuai-Lai Yang[1], Xin-Ming Yin[1], Yu-Qiang Xi[1]

1 *Department of Entomology, Henan Agricultural University, No. 95 Wenhua Road, Jinshui District, Zhengzhou 450003, Henan Province, China*
Corresponding author: Yu-Qiang Xi (yuqiangxi2012@126.com)

Abstract

Four new species of the genus *Hendelia* Czerny, 1903 collected from China, are described as new to science: *H. latustigenis* **sp. nov.**, *H. macrocera* **sp. nov.**, *H. deltoides* **sp. nov.** and *H. flavida* **sp. nov.** An updated key to the species of *Hendelia* from China is presented.

Key words: China, Clusiodinae, druid flies, identification key, new species, taxonomy

OPEN ACCESS

Academic editor: Owen Lonsdale
Received: 15 May 2024
Accepted: 12 August 2024
Published: 19 September 2024

ZooBank: https://zoobank.org/3B19DC59-A4C7-4939-AA83-85F959EFCC63

Citation: Yang S-L, Yin X-M, Xi Y-Q (2024) Four new species of the genus *Hendelia* Czerny, 1903 (Diptera, Clusiidae) from China. ZooKeys 1212: 255–266. https://doi.org/10.3897/zookeys.1212.127558

Copyright: © Shuai-Lai Yang et al.
This is an open access article distributed under terms of the Creative Commons Attribution License (Attribution 4.0 International – CC BY 4.0).

Introduction

Clusiidae (Diptera, Acalyptratae) are species commonly called “druid flies”, and comprise 14 genera and at least 640 species (Lonsdale 2017; Yang et al. 2021). The genus *Hendelia* Czerny, 1903 belongs to the subfamily Clusiodinae. Its generic characteristics include small lobate surstyli that are directed towards each other, a male perianal region (desclerotized triangle surrounding the anus) that is longer than wide, an ejaculatory apodeme that is widest apically, and a plumose arista (modified in some species) (Lonsdale and Marshall 2007). Features shared predominantly with its sister genus *Clusiodes* include strong interfrontal setae, reduced anterior and posterior fronto-orbitals, and highly derived genitalia including a keel-like phallapodeme and a subapical sclerotized disc on the ventral receptacle of the female (Lonsdale and Marshall 2011).

There are 59 described species of *Hendelia* distributed worldwide; 29 species are distributed in the Palaearctic and Oriental regions; four species are known in Japan: *H. plumosa* (Sasakawa), *H. angulosa* (Sueyoshi), *H. plumipes* (Sasakawa) and *H. beckeri* Czerny; three species are known in Russia (Far East): *H. quatuorsetosa* (Mamaev), *H. bisetosa* (Mamaev) and *H. unica* (Mamaev) (Sasakawa 1964; Mamaev 1974; Sasakawa 1987; Lonsdale 2017). Three species are known in China: *Hendelia beckeri* Czerny,1903, *H. formosana* (Hennig,1938) and *H. freyi* (Soós,1963); these species were found in Sichuan, Taiwan and Zhejiang provinces (Hennig 1938; Soós 1963; Lonsdale and Marshall 2007; Lonsdale 2017).

In this study, four new species are described from China: *Hendelia latustigenis* sp. nov., *H. macrocera* sp. nov., *H. deltoides* sp. nov. and *H. flavida* sp. nov. A key to the known species of *Hendelia* from China and some Palaearctic and Oriental species is presented.

Material and methods

Genitalia preparations were made by removing and macerating the apical portion of the abdomen in glacial acetic acid, then rinsing in distilled water before storage in glycerin-filled microvials. Specimens were examined and photographed using a Leica M205A microscope. After examination, genitalia were transferred to fresh glycerin and stored in a microvial on the pin below the specimen or moved to an ethanol tube together with the wet specimens. The coordinates of the collection site were obtained by asking the collectors. Image plates were post-processed with Adobe PHOTOSHOP CC 2019 Extended.

Specimens examined were deposited in the Entomological Museum of Henan Agricultural University (HAU), Zhengzhou. Terminology follows Lonsdale and Marshall (2006). The M_1 ratio is defined as the length of the ultimate section of wing vein M divided by the length of the penultimate section (Lonsdale and Marshall 2006).

Taxonomy

Key to species of *Hendelia* of China and nearby countries

1 Two fronto-orbital setae **2**
– Three fronto-orbital setae **7**
2 Cerci large, height is 3.5 times the width ..... ***H. beckeri* Czerny**
– Cerci small **3**
3 Mesontum dark brown without stripes **4**
– Mesontum with brown stripes **5**
4 Vibrissae strongly elongated and thickened, setae on the surface of surstylus dense ..... ***H. quatuorsetosa* (Mamaev)**
– Vibrissae normal, setae on the surface of surstylus sparse ..... ***H. bisetosa* (Mamaev)**
5 Setae completely black, middle part of hypandrium with a finger-like projection ..... ***H. latustigenis* sp. nov.**
– Setae with brown, hypandrium without finger-like projection **6**
6 Legs yellow; postocellar seta smaller than ocellar seta ..... ***H. angulosa* (Sueyoshi)**
– Legs yellow except fore tarsus and most of fore tibia brownish-black, and hind tibia with pale brown rings near both apices; postocellar seta and ocellar seta almost the same length ..... ***H. plumosa* (Sasakawa)**
7 Vibrissae long and strong; interfrontal setae also very strong and nearly parallel ..... ***H. macrocera* sp. nov.**
– Vibrissae and interfrontal setae normal, no obvious extension **8**
8 Face entirely black ..... ***H. unica* (Mamaev)**
– Face not entirely black **9**
9 Setae yellow (at least for the head); mesonotum without stripes **10**
– Setae black; mesontum with stripes **11**
10 Mesonotum yellow, anterior margin and postpronotum brown ..... ***H. formosana* (Hennig)**
– Mesonotum black, mesonotum pollinose, weakly shining ..... ***H. plumipes* (Sasakawa) (female)**

11 Gena with 3 or 4 subgenal setae; thorax with 1 wide brownish-black longitudinal stripe ..... ***H. freyi* (Soós)**
– Gena not 3 subgenal setae; thorax with 3 thin pale brown stripes **12**
12 Front half of the face dark brown and the back half yellow; abdomen mainly dark brown ..... ***H. deltoides* sp. nov.**
– Frons and face light yellow; abdomen mainly light yellow ... ***H. flavida* sp. nov.**

***Hendelia deltoides* sp. nov.**

https://zoobank.org/17AF0495-DCC1-4FEF-AFB5-5094581FA3A6

Figs 1–6, 31

Type material. ***Holotype***: • 1 ♂; China, Shaanxi, Zhouzhi, Taibai Mt.; 33°57'18"N, 107°45'48"E; 1711 m; 2015. VII. 29; leg. Ning Jinjin. ***Paratypes***: • 1 ♂; same data as for holotype; 2015.VII.30; leg. Li Xuankun; • 1 ♂; China, Chongqing, Yingtiaoling Nature Reserve; 31°28'44.93"N, 109°53'26.19"E; 1373 m; 2022. VI. 26; leg. Xu Rongzhen; • 1 ♂; China, Chongqing, Yingtiaoling Nature Reserve; 31°28'44.93"N, 109°53'26.19"E; 1373 m; 2022.VI.26; leg. GuanYuliang.

Diagnosis. Head mostly yellow; palpus white; face dark brown and back half yellow. Thorax mainly yellow; with 3 light brown stripes extending to the scutellum. Surstylus nearly triangular, 1/5 length of genitalia, apex without spines. Hypandrium with 4 setae.

Description. Male. Body length 4.4–4.6 mm; Wing length 4.2–4.4 mm.

Head (Fig. 1) width 1.49 mm, mostly yellow; palpus white; face dark brown and the back half yellow; frons yellow, 3 fronto-orbital setae, 1 interfrontal seta; occiput yellow; gena yellowish, more than 1/4 height of eye; antenna yellow, pedicel length 0.20 mm, arista very short plumose; 1 ocellar seta and 1 postocellar seta.

Thorax (Fig. 31) width 1.04 mm, mainly yellow; scutum with 3 light brown stripes extending to the scutellum; scutellum yellow, anepisternum yellow with brown spots, katepisternum yellowish; prescutellar seta absent; 1 postpronotal seta, 2 notopleural setae, 1 postsutural supra-alar seta, 1+2 dorsocentral setae, dark brown; intra-alar seta absent, 2 postalar setae, dark brown, the posterior seta tiny; 1 lateral scutellar seta, 1 apical scutellar seta, strong and dark brown; anepisteral seta absent, 1 katepisternal seta. Legs light yellow. Wing (Fig. 2) with light brown spots on distal 1/3 and on M_4; the M_1 ratio 4.9; halter white.

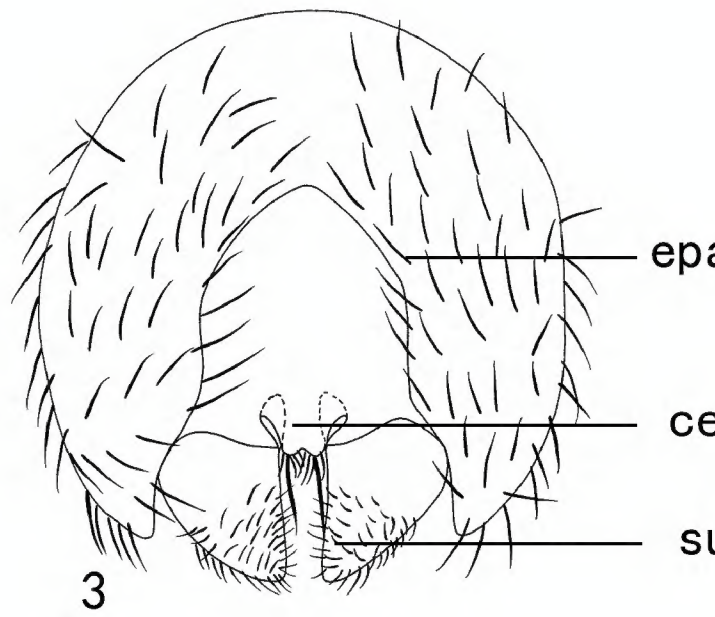
Abdomen mainly brown; anterior edge of each abdominal segment yellowish, setae and setulae dark brown. Male genitalia (Figs 3–6): epandrium height and width almost equal. Cerci 0.9 times as high as wide, with small setae on outer surface and one long seta at apex. Surstylus nearly triangular, 1/5 length of genitalia, apex without spines. Hypandrium with 4 setae; pregonite slightly chitinized; postgonite with small setae at apex; side of phallus slightly chitinized, distiphallus long, membranous, transparent.

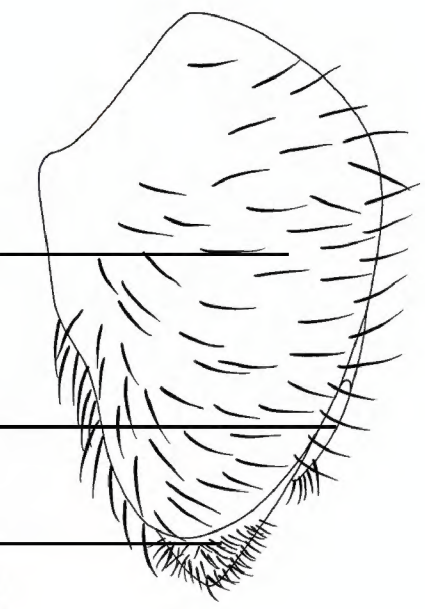
Female. Unknown.

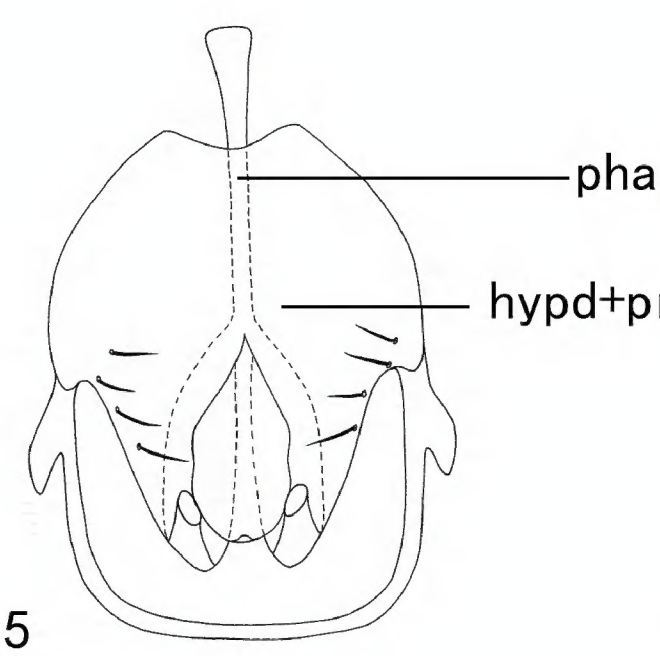
Distribution. China (Shaanxi, Chongqing).

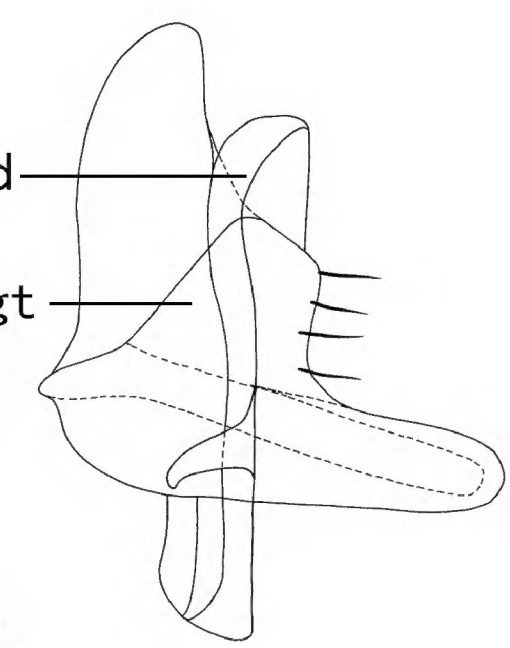
Etymology. The specific name "*deltoides*" refers to the surstylus, which is nearly triangular.

Remarks. The species is similar to *H. angulosa* (Sueyoshi), but it can be separated by the face black and the three fronto-orbital setae. In *H. angulosa* (Sueyoshi), the face is yellow and the head has only two fronto-orbital setae (Sueyoshi 2006).









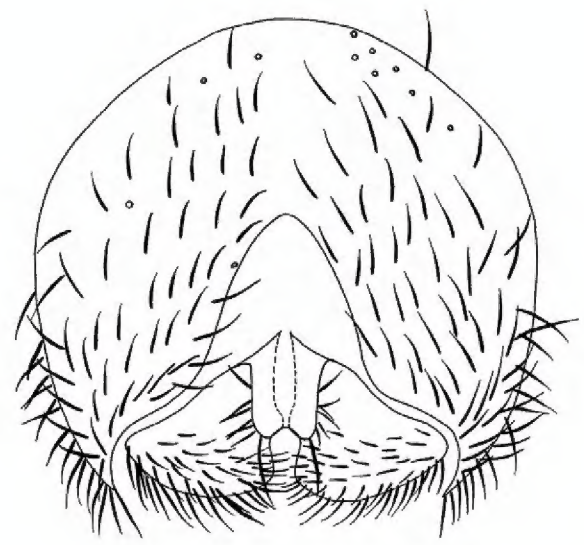
Figures 1–6. *Hendelia deltoides* sp. nov. (male) **1** head, lateral view **2** wing **3** epandrium, cerci, and surstyli, posterior view **4** epandrium, cerci, and surstyli, lateral view **5** hypandrial complex, posterior view **6** hypandrial complex, lateral view. Scale bars: 0.1 mm. Abbreviations: epand – epandrium; cerc – cerci; sur – surstylus; hypd – hypandrium; pregt – pregonite

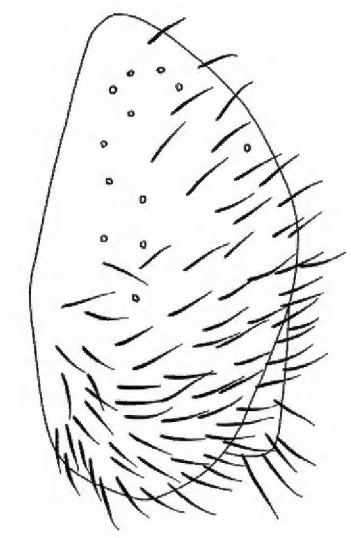
***Hendelia macrocera* sp. nov.**

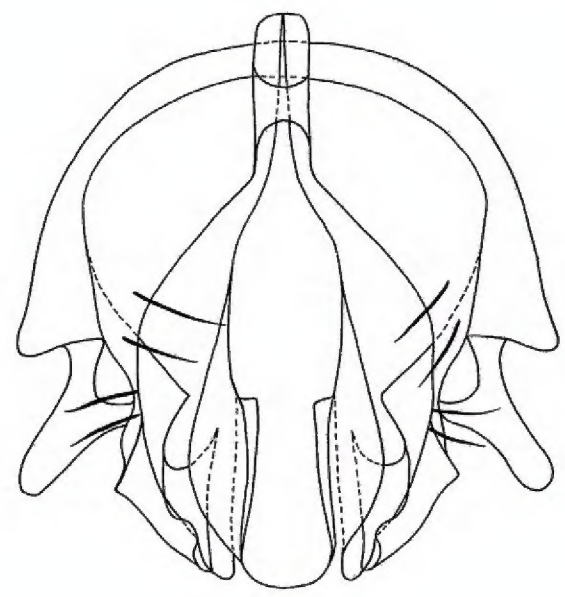
https://zoobank.org/20740AED-CE48-476B-8C41-0550DE4E2482

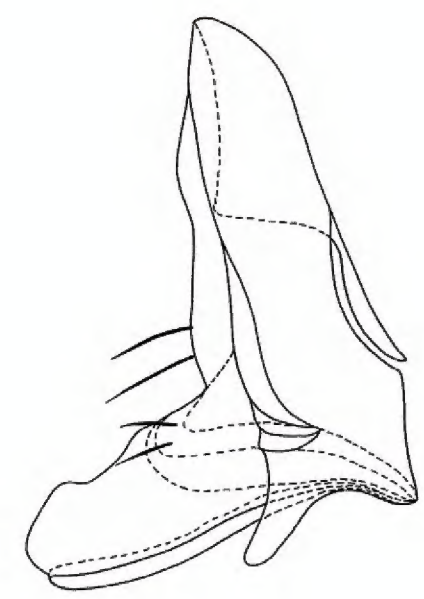
Figs 7–12, 32

Type material. ***Holotype***: • ♂; China, Shaanxi, Zhouzhi, Houzhenzi; 33°51'3.056"N, 107°50'37.924"E; 1545 m; 2015. VIII. 2; Leg. Li Xuankun. ***Paratypes***: • 2 ♂♂; same data as holotype.









Figures 7–12. *Hendelia macrocera* sp. nov. (male) **7** head, lateral view **8** wing **9** epandrium, cerci, and surstyli, posterior view **10** epandrium, cerci, and surstyli, lateral view **11** hypandrial complex, posterior view **12** hypandrial complex, lateral view. Scale bars: 0.1 mm.

Diagnosis. Head mostly yellowish, including face and frons; palpus yellowish-white; interfrontal seta long and strong; pedicel very long. Scutum with Y-shaped brown stripe extending to scutellum. Surstylus nearly "triangular" in shape. Hypandrium with two pairs of ventromedial setae.

Description. Male. Body length 4.3–4.5 mm, Wing length 4.2–4.4 mm.

Head (Fig. 7) width 1.63 mm, mostly yellowish; palpus yellowish-white; 3 fronto-orbitals, setae small; interfrontal seta long and strong, some small setulae around the interfrontal seta; occiput yellowish with sparse small setae; gena more than 1/3 height of eye; antenna yellow, pedicel length 0.15 mm, twice

length of first flagellomere, scape brown, arista sparsely short plumose; 1 ocellar seta and 1 postocellar seta, small; vibrissae very strong.

Thorax (Fig. 32) width 1.26 mm, mainly yellowish; scutum with brown Y-shaped stripe extending onto scutellum; scutellum yellowish on both sides, anepisternum with pale brown longitudinal stripes, katepisternum yellowish. Prescutellar seta absent; 1 postpronotal seta, 2 notopleural setae, 1 postsutural supra-alar seta, 1+2 dorsocentral setae, dark brown; intra-alar seta absent, 2 postalar setae, dark brown, posterior seta tiny; 2 lateral scutellar setae, 1 apical scutellar seta, strong and dark brown; 1 anepisternal seta, 1 katepisternal seta. Leg yellowish. Wing (Fig. 8) with light brown spots on distal 1/3, along veins R_{2+3}, the M_1 ratio 2.8; halter white.

Abdomen brown, setae and setulae dark brown. Male genitalia (Figs 9–12): epandrium 0.8 times as high as wide. Cerci small, the height and width almost equal, slightly separated distally, with small setae on the outer surface and one longer seta at apex. Surstylus nearly triangular in shape, 0.4 times the length of the genitalia, apex without spines. Hypandrium with 2 long setae at the apex. Distiphallus long, membranous.

Female. Unknown.

Distribution. China (Shaanxi).

Etymology. The specific name "*macrocera*" refers to the long antennae.

Remarks. The new species is similar to *H. extensicornis* Frey, but can be separated by the long, strong vibrissae; the interfrontal setae are also very strong and nearly parallel. In *H. extensicornis* Frey, the vibrissae are small and the interfrontal setae are small and crossed (Frey 1960).

***Hendelia latustigenis* sp. nov.**

https://zoobank.org/3300FE52-4C28-498A-B722-411FFB7DBBC8

Figs 13–18

Type material. ***Holotype***: • 1 ♂; China, Shaanxi, Zhouzhi, Taibai Mt.; 1711 m; 33°57'18"N, 107°45'48"E; 2015. VII. 30; leg. Li Xuankun. ***Paratypes***: • 1 ♂; same date as holotype.

Diagnosis. Head mostly yellowish, palpus yellowish-white. Mesontum with 2 brown stripes extending to the anterior margin of scutellum; hypandrium with medial finger-like projection that has 2 long setae apically.

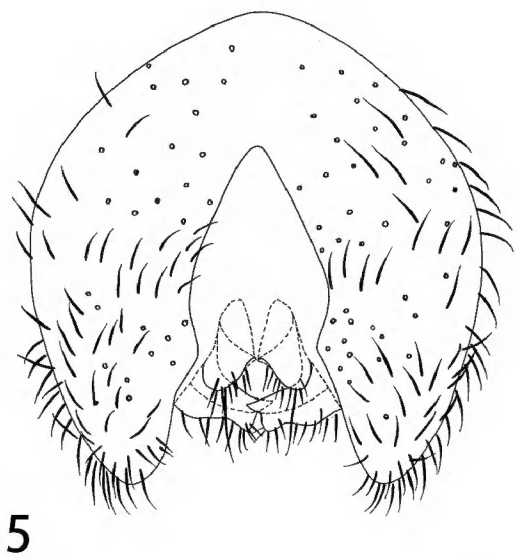
Description. Male. Body length 4.2–4.5 mm, Wing length 4.1–4.3 mm.

Head (Fig. 13) width 1.28 mm, mostly yellowish; palpus yellowish-white; face and frons yellowish; 2 fronto-orbitals, the posterior seta 4 times longer than anterior seta; the interfrontal seta same length as anterior fronto-orbital; occiput yellowish, with small seta on lower edge; gena yellowish, more than 1/6 eye height; antenna yellow, pedicel length 0.16 mm, arista sparsely short plumose; 1 ocellar seta and 1 postocellar seta.

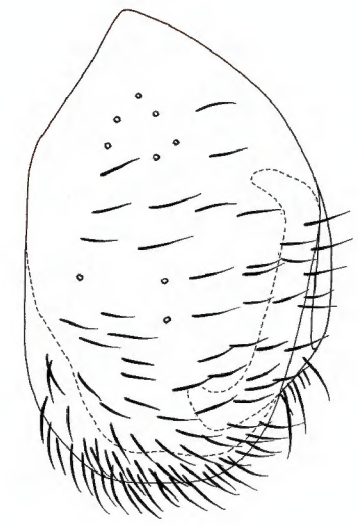
Thorax width 1.22 mm, mainly light yellow; with narrow brown stripe outside dorsocentral row extending to the anterior margin of scutellum (Fig. 14); scutellum, anepisternum and katepisternum yellowish; prescutellar seta absent; 1 postpronotal seta, 2 notopleural, 1 postsutural supra-alar seta, 1+2 dorsocentral setae, dark brown; intra-alar seta absent, 2 postalar setae, brown, with posterior seta tiny; 2 lateral scutellar setae, 1 apical scutellar seta, strong and dark brown; 1 anepisternum seta, 1 katepisternal seta. Leg light yellow; halter white.

13

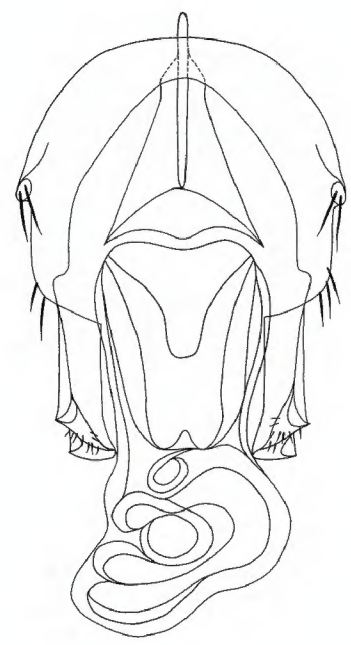
14



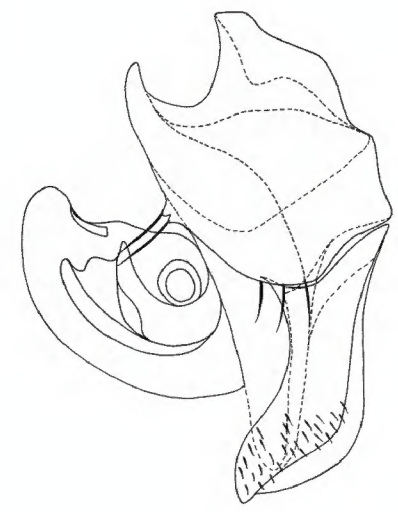
15



16



17



18

Figures 13–18. *Hendelia latustigenis* sp. nov. (male) **13** head, lateral view **14** mesothorax, dorsal view **15** epandrium, cerci, and surstyli, posterior view **16** epandrium, cerci, and surstyli, lateral view **17** hypandrial complex, posterior view **18** hypandrial complex, lateral view. Scale bars: 0.1 mm.

Abdomen brown; setae and setulae dark brown. Male genitalia (Figs 15–18): epandrium 1.2 times higher than wide. Cercus height 1.8 times width, separated on distal 1/2, with small setae on outer surface and one long seta at apex. Surstylus 1/4 length of genitalia, apex without spines. hypandrium with medial finger-like projection that has 2 long setae apically, posterior part of hypandrium with 2 or 3 medium setae; pregonite slightly chitinized, with small apical setae.

Female. Unknown.

Distribution. China (Shannxi).

Etymology. The specific name "*latustigenis*" refers to the relatively wide gena.

Remarks. The new species is distinct from other species in the middle part of the hypandrium with a finger-like projection at the tip of which there are two long setae, and in the lower part of the hypandrium with two or three medium setae. The wings of the type specimen are damaged.

***Hendelia flavida* sp. nov.**

https://zoobank.org/60030C35-B4CD-417F-AC8F-22574FECDEA9

Figs 19–24, 34

Type material. ***Holotype***: • ♂; China, Yunnan, Gongshan, Xianjiudan; 27°56'13.524"N, 98°19'55.250"E; 1679 m; 2013. VII. 3; leg. Li Xuankun. ***Paratypes***: • 2 ♂♂; same data as holotype.

Diagnosis. Body mostly yellow. Head and thorax yellowish; palpus white; scutum with 3 indistinct brown stripes. Cerci very small, outline nearly that of an equilateral triangle, fully fused. Pregonite with 4 medial setae, lacking any other smaller setae or setulae.

Description. Male. Body length 3.4–3.6 mm, Wing length 2.2–2.4 mm

Head (Fig. 19) width 0.50 mm, yellowish; palpus white; face yellowish; frons yellowish, 3 fronto-orbital setae, first seta and last seta small, medium seta strong, 1 interfrontal seta, strong; occiput yellowish with small sparse brown setae; gena yellowish, more than 1/5 height of eye; antenna yellowish, pedicel length 0.19 mm, first flagellomere brown apically, arista sparse short plumose; 1 strong ocellar seta, equal in length to interfrontal seta, 1 small postocellar seta, almost as long as anterior fronto-orbital seta.

Thorax width 0.98 mm, mainly yellowish with 3 indistinct brown stripes; scutellum, anepisternum and katepisternum yellowish; prescutellar seta absent; 1 postpronotal seta, 2 notopleural setae, 1 postsutural supra-alar seta, 1+2 dorsocentral setae, dark brown, the last long; intra-alar seta absent, 2 post-alar setae, dark brown; 1 lateral scutellar seta, 1 apical scutellar seta, strong; 1 anepisternum seta, 1 katepisternal seta. Legs light yellow with tibiae brown. Wing (Fig. 20) clouded on distal 2/5, becoming darker anteriorly, and around middle of M_1; M_1 ratio 6; halter white.

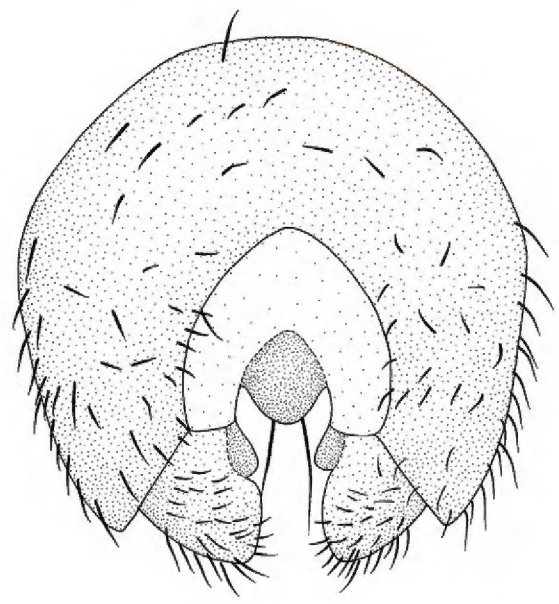
Abdomen dark yellow and white; setae and setulae brown. Male genitalia (Figs 21–24): epandrium height and width subequal in length. Cerci very small, outline almost that of equilateral triangle, not separated, height 0.9 times width. Surstylus 0.4 times length of epandrium, with many small setae on inner and outer surfaces, apex without spines. Pregonite with 4 medial setae, lacking any other smaller setae or setulae. Distiphallus short, membranous.

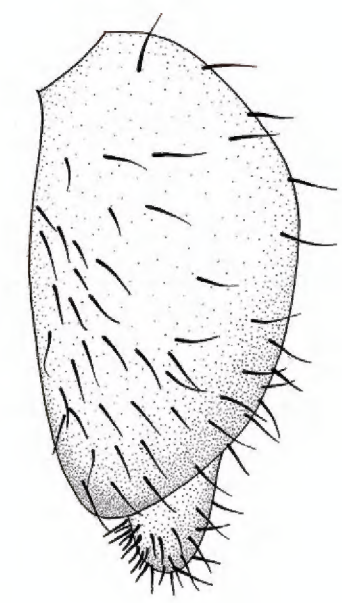
Female. Unknown.

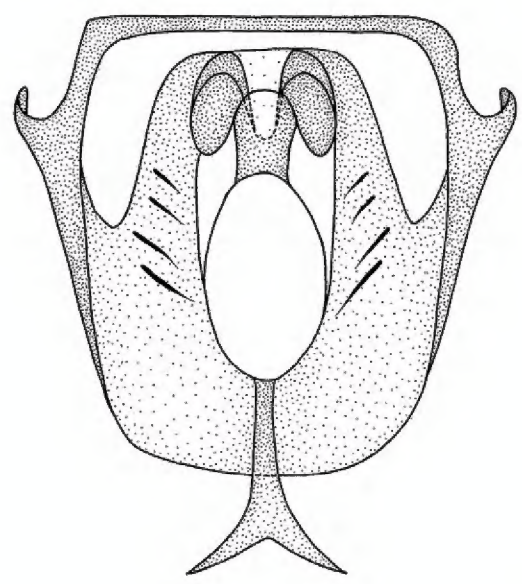
Distribution. China (Yunnan).

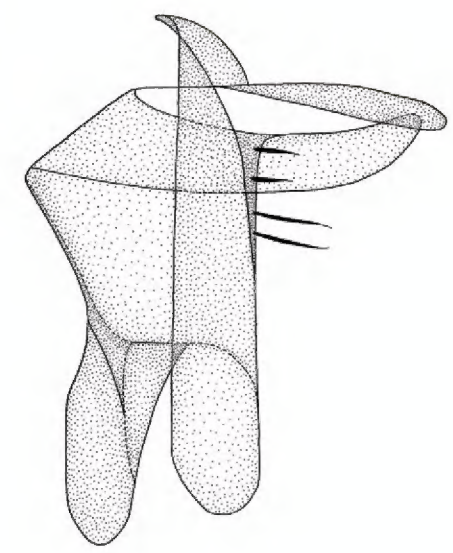
Etymology. The specific name "*flavida*" refers to the colour of this species, which is mostly pale yellow.

Remarks. The new species is similar to *H. plumosa* (Sasakawa), but it differs in having a yellowish head, indistinct stripes on the scutum, and fully fused cerci. In *H. plumosa* (Sasakawa), the head is yellow, the thorax is more distinctly striped, and the cerci are separated (Sueyoshi 2006).







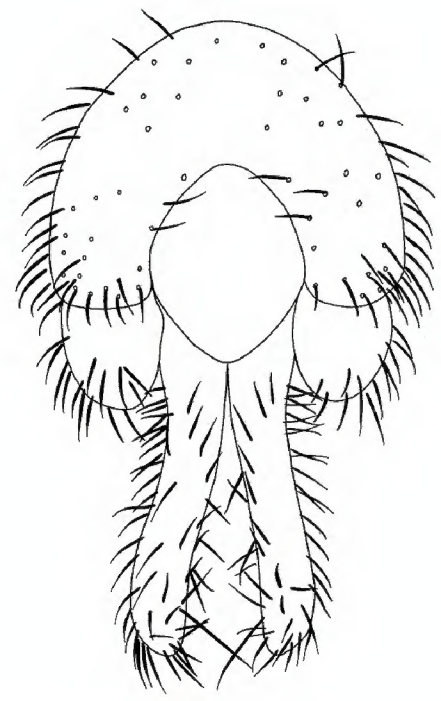


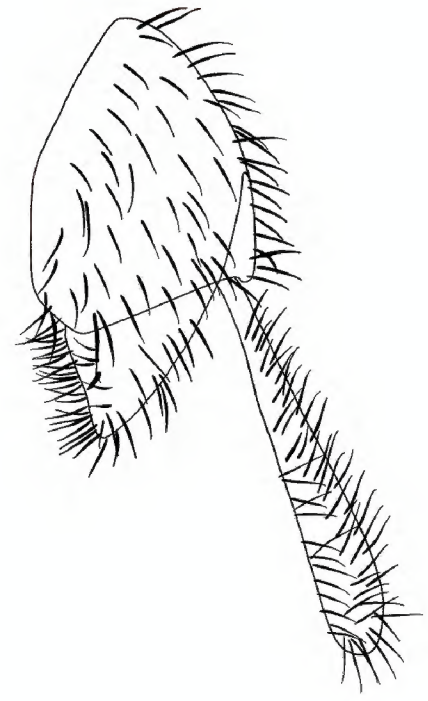
Figures 19–24. *Hendelia flavida* sp. nov. (male) **19** head, lateral view **20** wing **21** epandrium, cerci, and surstyli, posterior view **22** epandrium, cerci, and surstyli, lateral view **23** hypandrial complex, posterior view **24** hypandrial complex, lateral view. Scale bars: 0.1 mm.

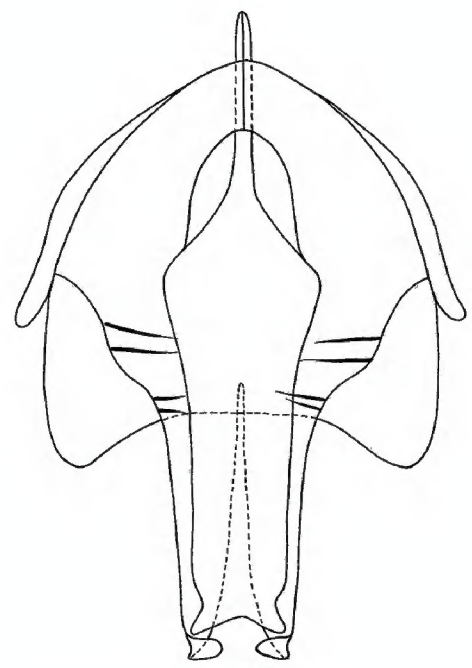
***Hendelia beckeri* Czerny, 1903**

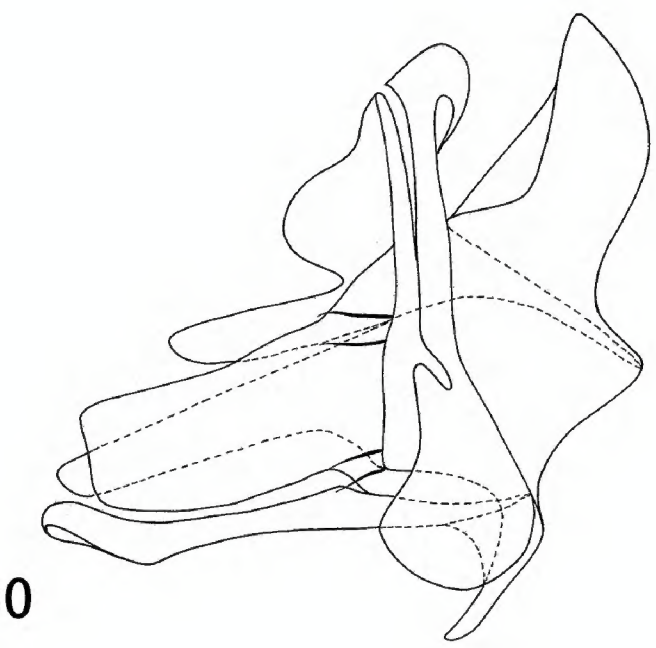
Figs 25–30, 33

Material examined. •1 ♂; China, Hebei, Xinlong, Wulingshan, Shibatan; 40°33'34.524"N, 117°28'53.187"E; 2019. VI. 12; leg. Yang Ding; • 2 ♂♂; China, Sichuan, Pingwu, Wanglang National Natural Reserve; 32°54'29"N, 104°09'28"E; 2480 m; 2017. VIII. 1; leg. Xi Yuqiang; • 1 ♂; China, Hebei, Xinglong, Wulingshan, Dujuanfeng; 40°31'49.569"N, 117°30'26.503"E; 2019. VI. 11; leg. Yang Ding.









Figures 25–30. *Hendelia beckeri* (male) **25** head, lateral view **26** wing **27** epandrium, cerci, and surstyli, posterior view **28** epandrium, cerci, and surstyli, lateral view **29** hypandrial complex, posterior view **30** hypandrial complex, lateral view. Scale bars: 0.1 mm.

Distribution. China (Sichuan, Zhejiang, Hebei); central Europe to Norway and Finland; eastern and northern coasts of Black Sea; central and eastern Russia, Japan, South Korea.

Figures 31–34. Mesothorax, dorsal view **31** *Hendelia deltoides* sp. nov. **32** *Hendelia macrocera* sp. nov. **33** *Hendelia beckeri* (male) **34** *Hendelia flavida* sp. nov.

Acknowledgements

We are grateful to Prof. Ding Yang (Beijing), Dr Xuankun Li (Beijing), Dr Rongzhen Xu (Beijing), Dr Jinjin Ning (Beijing), Dr Yuliang Guan (Zhengzhou) for their kind help in collecting the specimens.

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

Funding

This work was supported by the Natural Science Foundation of Henan (NO. 232300420010), Undergraduate teaching engineering course construction project of Henan Agricultural University (NO. 2023KC03), the National Natural Science Foundation of China (No. 31672333), the Special Foundation for National Science and Technology Basic Research Program of China (NO. 2018FY100400), the earmarked fund for CARS (NO. CARS-27) and the Natural Science Youth Innovation Fund of Henan Agricultural University (NO. KJCX 2019A11).

Author contributions

All authors have contributed equally.

Author ORCIDs

Shuai-Lai Yang https://orcid.org/0009-0002-6813-8949
Xin-Ming Yin https://orcid.org/0000-0003-3936-3557
Yu-Qiang Xi https://orcid.org/0000-0002-3285-8904

Data availability

All of the data that support the findings of this study are available in the main text or Supplementary Information.

References

Frey R (1960) Studien über indoaustralische Clusiiden (Dipt.) nebst Katalog der Clusiiden. Commentationes Biologicae 22 (2): 1–31.

Hennig W (1938) Beiträge zur Kenntnis der Clusiiden und ihres Kopulationsapparates (Dipt. Acalypt.). Encyclopédie Entomologique 9 (B), II: 121–138.

Lonsdale O (2017) World catalogue of the Druid Flies (Diptera: Schizophora: Clusiidae). Zootaxa 4333: 1–85. https://doi.org/10.11646/zootaxa.4333.1

Lonsdale O, Marshall SA (2006) Revision of the New World *Craspedochaeta* Czerny. Zootaxa 1291: 1–101. https://doi.org/10.11646/zootaxa.1291.1.1

Lonsdale O, Marshall SA (2007) Redefinition of the genera *Clusiodes* and *Hendelia* (Diptera: Clusiidae: Clusiodinae), with a review of *Clusiodes*. Studia Dipterologica 14: 117–159.

Lonsdale O, Marshall SA (2011) Revision of the New World *Hendelia* (Diptera: Clusiidae: Clusiodinae). Zootaxa 2748: 1–17. https://doi.org/10.11646/zootaxa.2748.1.1

Mamaev BM (1974) [New species of clusiids (Diptera, Clusiidae) from the Southern Primorye.] In: Mamaev BM (Ed.) [Insects: Destroyers of wood in the forest biocenoses in the southern Primorye]. A.N. Severtsov Institute of Evolutionary Morphology and Ecology of Animals at the Academy of Sciences of the USSR. Nauka Publishing House, Moscow, 111–115. [in Russian, 1974]

Sasakawa M (1964) Descriptions of two new species of Clusiidae from Japan. Transactions of the Kyoto Entomological Society 12(2): 13–16.

Sasakawa M (1987) Studies on the Oriental and Pacific Clusiidae (Diptera) Part 4. Kontyû 55 (1): 100–115.

Soós A (1963) *Prohendelia* (*Prohendelia*) *freyi* spec. nov., and some notes on the genus *Hendelia* Czerny S.L. (Diptera: Clusiidae). Acta Zoologica Hungarica 9(1–2): 177–182.

Sueyoshi M (2006) Species diversity of Japanese Clusiidae (Diptera: Acalyptrata) with description of 12 new species. Annales de la Société Entomologique de France 42(1): 1–26. https://doi.org/10.1080/00379271.2006.10697445

Yang SL, Yin XM, Xi YQ (2021) Three new species of the genus *Czernyola* Bezzi, 1907 (Diptera, Clusiidae) from China. Zookeys 1029: 175–183. https://doi.org/10.3897/zookeys.1029.63696